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Fungal growth on bare rock surfaces – where do they get carbon from?

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Primary successions in terrestrial ecosystems often involve microbial growth on bare rock surfaces. In these extremely stressful environments, complex microbial communities must adapt to conditions of low water and nutrient availability, high solar irradiation as well as extremes of temperature. Although microbial members of rock-inhabiting communities vary, the presence of yeast-like black fungi [micro-colonial fungi (MCF)] is common in subaerial biofilms. Even colonisation of alpine rocks by so-called “Tintenstriche”, which was originally attributed exclusively to cyanobacteria (Jaag, 1945), always involves MCFs. As heterotrophic micro-organisms, fungi require an organic source of carbon. To assess the importance of carbon inputs, we simulated growth of a single fungal micro-colony on a solid rock surface. Analysis of this model (Chertov et al., 2004) showed that the continued lack of organic nutrition is a major environmental factor in limiting growth of MCF on exposed rock surfaces. We suggest that fungi either use an atmospheric source of organic carbon which can be particulate or volatiles (or both), or associate with phototrophic components of the subaerial microbial community. An atmospheric carbon impact has to be considered as a major factor supporting the growth of rock inhabiting fungi. This is documented by the complete spatial separation of phototrophs and heterotrophs in the case of desert rock pebbles.

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